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In addition to the usual problems associated with school construction and safety standards experienced by most states, California has the additional one of coping with earthquakes. Older school buildings which may no longer provide a safe or adequate environment for education have become a matter of increasing concern to legislators and responsible citizens. Assembly Bill 450 which was passed in 1967 intends that all structurally deficient pre-1933 school buildings will have been repaired or replaced by 1983. Thus the crisis is one which is taxing the imagination and resources of school officials whose buildings do not comply with the state safety standards. The magnitude of the problem is discussed in terms of dollars and cents. Survey expectations are outlined for those districts that request a safety survey along with recommendations for modernization. The question of rehabilitation versus replacement is presented along with guidelines in terms of a questionnaire for the determination of educational adequacy. In salvaging old schools facility upgrading, suggestions are made that the primary considerations in addition to earthquake safety should be to provide open, flexible spaces where interiors can be readily modified to accommodate many varied teaching-learning activities. (NI)

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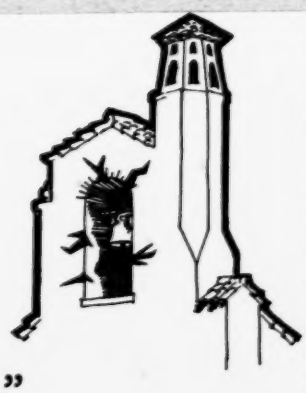
CRACKS in the BELFRY

"A CALIFORNIA SCHOOL CRISIS"



BUREAU OF SCHOOL PLANNING

CALIFORNIA STATE DEPARTMENT OF EDUCATION
Max Rafferty—Superintendent of Public Instruction
Sacramento 1968

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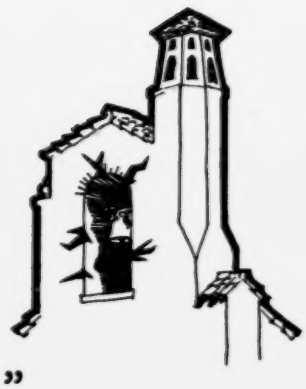

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OFFICE OF EDUCATION

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CALIFORNIA STATE DEPARTMENT OF EDUCATION
Max Rafferty – Superintendent of Public Instruction
Sacramento
1968

FOREWORD

A very serious crisis exists for many California school districts. Hundreds of millions of dollars worth of school buildings, housing approximately 600,000 children, do not meet the legal structural requirements of Title 21 of the California Administrative Code. These buildings, constructed prior to 1933, are considered to be unsafe under earthquake conditions. Buildings constructed since 1933 are designed to rigid safety standards. Therefore, California presently has a dual level of safety for its school children.

In 1967, the California Legislature enacted Assembly Bill 450 into law. This statute requires that school districts adopt and implement a plan for the orderly repair, reconstruction, or replacement of these older school buildings. Obtaining the necessary funds to correct these buildings is an unsurmountable problem for many districts which are unable to comply with the law without financial assistance from the State.

The following report is intended to provide school boards and their staffs with information regarding safety laws; the magnitude of the problem; recently enacted statutes which require board action to correct these unsafe schools; and criteria and guidelines for appraising pre-1933 buildings to determine whether they should be repaired or abandoned.

Max Rafferty

Superintendent of Public Instruction

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INTRODUCTION

The earth's crust is breaking! Forces are at work molding the skin of the globe, distorting and fracturing it. This process has continued since the beginning of the earth's formation. Every mountain range in the world today consists largely of sedimentary rocks which were at one time on the bottom of oceans. During the process of being elevated and folded into mountains or lowered back into the earth's surface, these rock formations frequently break and each break is an earthquake.

Each year the planet earth experiences about 10 major earthquakes, 100 destructive earthquakes, 1,000 shocks which cause property damage, and perhaps 100,000 shocks which are felt over a wide area.

Any region which has had earthquakes in the past may expect them in the future because earthquake-producing forces are continually at work. There may be a time lapse between destructive earthquakes, but repetitions of previous shocks will inevitably occur. California is in a location of unusual hazard. Roughly 80 percent of the seismic energy of the world is released in an area which girdles the Pacific Ocean. It is likely that most California schools will experience at least one strong earthquake and many minor shocks during their usable life span.

A major earthquake is awesome. On March 27, 1964, the Alaskan earthquake lifted 25,000 square miles of coastline as much as 50 feet. Damage exceeded $750 million, and 114 lives were lost. If an earthquake of this magnitude had occurred in California, it would have caused a disaster comparable to the 1923 earthquake in Japan which destroyed 50 percent of Tokyo and 90 percent of Yokohama and cost 95,000 lives.

The San Francisco earthquake in 1906 destroyed about 60 percent of the city, but much of this damage was by fire. In a modern city, fire is likely to be more destructive than earth tremors if broken water mains render fire-fighting equipment useless.

In 1952 an earthquake in the Bakersfield area destroyed 481 school rooms. This represented a 38 percent loss of all the district's classrooms, temporarily or permanently.

It was the earthquake that struck Long Beach, Compton, and other southern California communities on March 10, 1933, that had the greatest impact on California schools, not because of earthquake damage which was extensive, but because of the response by state legislators. Assemblyman Don Field introduced an earthquake safety law that subsequently became known as the Field Act. (See Chapter I.) During the 35 years since this initial legislation, the State of California has attempted to create and enforce school safety standards.

Older school buildings which may no longer provide a safe or adequate environment for education have become a matter of increasing concern to legislators and responsible citizens. This concern caused passage of Assembly Bill 450 during the 1967 Legislative Session. This statute is now taxing the imagination and resources of school officials in those districts with school buildings that do not comply with state safety standards. The following seven short chapters tell the story of this crisis, created not by legislators or legislation, but by the procrastination of many districts in providing legally safe school housing. The material is intended to inform and guide boards of trustees in decision making.

Chapter I
THE FIELD ACT AND RELATED REGULATIONS

CHAPTER I

THE FIELD ACT AND RELATED REGULATIONS

On the Friday evening of March 10, 1933, at 5:55 p.m., much of southern California was shaken by a severe earthquake. Heaviest losses were sustained in the Long Beach and Los Angeles areas, where there was widespread damage to school buildings. If the earthquake had occurred during school hours, the toll of dead and injured school children would have been great and tragic. Investigations of the damaged buildings indicated that they failed to resist the horizontal forces imposed by ground movement. In many cases, the engineering design for the buildings had not included provisions for seismic forces.

THE FIELD ACT

A wave of public indignation swept the state when it became general knowledge that many schools were not designed to resist earthquakes. State legislators responded to their constituents by making earthquake safety for public schools an issue of immediate concern. Assembly Bill 2342, introduced into the California Legislature by Assemblyman Don Field of Glendale, was enacted into law and became effective on April 10, 1933. This Assembly Bill is now part of the California Education Code, Part 3, Division 11, Chapter 2, Article 4, Sections 15451 - 15465. This legislation has been amended, but not substantially changed in the subsequent 35 years. It is commonly known as the "Field Act" and includes the following provisions:

> 15451. The Department of General Services under the police power of the State shall supervise the construction of any school building or, if the estimated cost exceeds ten thousand dollars ($10,000), the reconstruction or alteration of or addition to any school building, for the protection of life and property. . .
>
> 15454. The Department of General Services shall pass upon and approve or reject all plans for the construction or alteration of any school building. To enable it to do so, the governing board of each school district and any other school authority before adopting any plans for a school building shall submit the plans to the Department of General Services for approval. . . .
>
> 15455. Before letting any contract for any construction or alteration of any school building, the written approval of the plans, as to safety of design and construction, by the Department of General Services, shall be first had and obtained.

15459. All plans, specifications, and estimates shall be prepared by a certified architect holding a valid license under Chapter 3 of Division 3 of the Business and Professions Code or by a structural engineer holding a valid certificate to use the title structural engineer under Chapter 7 of Division 3 of the Business and Professions Code, and the supervision of the work of construction shall be under the responsible charge of such an architect or structural engineer, except that where plans, specifications, and estimates for alterations or repairs do not involve architectural or structural changes said plans, specifications, and estimates may be prepared and work of construction may be supervised by a professional engineer duly qualified to perform such services and holding a valid certificate under Chapter 7 of Division 3 of the Business and Professions Code for performance of services in that branch of engineering in which said plans, specifications, and estimates and work of construction are applicable.

15461. From time to time, as the work of construction of alteration progresses and whenever the Department of General Services requires, the certified architect or structural engineer in charge of construction or registered engineer in charge of other work, the inspector on the work, and the contractor shall each make to the Department of General Services a report duly verified by him, upon a form prescribed by the Department of General Services, showing, of his own personal knowledge, that the work during the period covered by the report has been performed and materials used and installed, in every particular, in accordance with the approved plans and specifications, setting forth such detailed statements of fact as are required by the Department of General Services.

15463. . . . the school district, city, city and county, or the political subdivision within the jurisdiction of which any school building is constructed or altered shall provide for and require competent, adequate, and continuous inspection during construction or alteration by an inspector satisfactory to the architect or structural engineer and the Department of General Services . . .

THE GARRISON ACT

In 1939, the State Legislature added another segment to the Field Act, designed to provide an enforcement mechanism. This statute, called the Garrison Act, provides that if a school building is inspected for structural adequacy (which is interpreted to mean compliance with the level of safety set forth in Title 21), and if the building is found to be inadequate, the school board must take action to correct the building or abandon it.

Although the intent of the Field and Garrison Acts has always been clear and many school districts have either rehabilitated or replaced these older buildings, other school districts have delayed in taking action. An opinion of the State Attorney General in 1966 brought statewide attention to the problem by holding that failure to repair any such building found

to be unsafe would result in personal liability to the school board members. Legislation in 1967, known as Assembly Bill 450, requires that pre-1933 school buildings shall be examined, and clarifies the issue of trustee liability and outlines specific actions required of a board to avoid such liability. (See Chapter III.)

The Field Act and the Garrison Act do not establish design criteria. This is accomplished under Title 21 of the California Administrative Code.

TITLE 21

The Field Act placed responsibility for establishing structural safety standards and their enforcement with the Division of Architecture, Department of Public Works; however, in 1963 this was transferred to the Department of General Services. This agency subsequently developed the regulation known as Title 21 of the California Administrative Code. Its purpose is to regulate the design and construction of public school buildings so that, in addition to the normal loads that such buildings are subjected, they shall resist earthquakes in so far as practicable.

In general, Title 21 requires a homogeneity of design in which the various elements of the building such as walls, roofs, and floors are tied together with sufficient strength to act together during a vibratory movement of the ground. Inertial forces generated by ground accelerations must be resisted by the various building elements. For example, forces imposed by the mass of the roof and walls of a structure may be transmitted by the roof, acting as a girder or diaphragm, to cross walls, acting as shear walls, which in turn deliver the forces to the ground. The transmission of these forces then depends upon the ability of the roof to act as a diaphragm, the ability of the cross walls to deliver the forces to the ground, and the strength of all the various connections between acting as links in a chain.

School buildings constructed prior to 1933 usually lack this homogeneity. Roof and floor structures usually are not constructed to act as diaphragms, cross walls are not able to resist the necessary lateral loads, and most of the connections are insufficient or missing.

Title 21 also includes provisions to strengthen or rehabilitate public school buildings built prior to the enactment of the Field Act in order to bring them into conformity with minimum legal requirements for the safety of school children. Any school building constructed prior to 1933 and not approved by the state probably is a nonconforming building and should now be considered potentially unsafe.

Following are some construction practices common before 1933 that are not allowed under Title 21 and must be remedied:

1) Brick walls built without reinforcing steel and using weak mortar must be removed or strengthened.

2) Unreinforced hollow tile partitions must be removed and replaced.

3) Weak concrete must either be removed and replaced or strengthened by gunite or other means.

4) Wood roof and floor members which are cast into concrete or masonry walls must be securely tied to the walls.

5) Plaster ceilings on wood lath must be replaced if it is apparent that the bonds or keys are weak.

TITLE 19

The Field Act includes a provision for the State of California to be vested with the authority to supervise the construction or remodeling of school buildings for the protection of life and property. In 1940, the Attorney General rendered the opinion that this requires the State to assure that school construction meets fire safety as well as structural safety standards. This opinion was subsequently upheld by the California Supreme Court. Fire and panic safety standards are part of the "Rules and Regulations of the State Fire Marshal" known as Title 19. These regulations establish minimum standards for the prevention of fire for the protection of life and property. Schools represent only one type of building affected. Therefore, the Office of Architecture and Construction, when reviewing plans and specifications for school construction, also checks for conformance with Title 19. Fire prevention engineers under the State Fire Marshal work directly with the reviewing structural engineers in this office.

TITLE 8

In 1958, an Attorney General's opinion extended the State's responsibility over school safety to include the mechanical and electrical elements. Also, the California Labor Code requires compliance with Title 8, the Safety Regulations of the Division of Industrial Relations.

RESPONSIBILITY FOR CODE ENFORCEMENT

The Office of Architecture and Construction checks all plans for public school construction for conformance to Title 21 and Title 19, and has responsibility for enforcing such regulations on construction or alteration projects which fall under the purview of the Field Act.

Inspection in the field for conformance to Title 19 (fire safety) and enforcement of these regulations on existing school buildings which are not being altered under the purview of the Field Act are the responsibility of the State Fire Marshal. Field inspections are made by fire engineers from the Office of the Fire Marshal or by local fire chiefs in those communities where these officials have the assigned authority to enforce fire regulations.

Field inspection and enforcement of the regulations in Title 8 (industrial safety) are a function of the Division of Industrial Safety.

If an architect or school administrator has questions concerning specific design or legal requirements of Title 21, Title 19, or Title 8, they should consult:

Office of Architecture and Construction
Schoolhouse Section
1108 O Street, Room 305
Sacramento, California 95814

CRITICISM OF SAFETY REGULATIONS

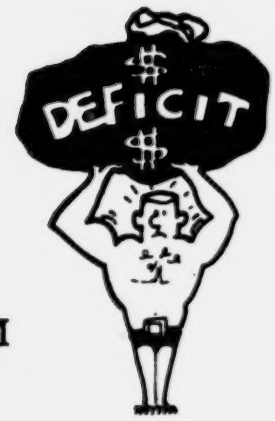
During 1965 - 1966, the State Legislature conducted a special interim study to determine if the structural design standards set forth in Title 21 are too rigid. The report of the interim subcommittee was submitted to the Legislature in 1967. This report, based on many hours of testimony from responsible authorities concluded that:

1) No area in California has immunity from earthquake hazard.

2) There is insufficient evidence to support the proposal that design standards are too rigid and might well be reduced.

3) Weakening of the law would constitute a compromise with school safety.

Chapter II
THE MAGNITUDE OF THE PROBLEM



CHAPTER II

THE MAGNITUDE OF THE PROBLEM

1962 Estimate

A report prepared by the Department of Education in 1966 determined that the total replacement costs of California's pre-Field Act schools would exceed $1.1 billion. The estimate was based on a 1962 inventory of facilities, which reported 3,414 pre-Field Act buildings in use. The Bureau of School Planning and the Office of Local Assistance developed data to determine the total number of teaching stations in these 3,414 schools. These teaching stations were loaded according to current practice and the figures were multiplied by the average cost per student taken from the current annual "Report of Activities" prepared by the Office of Local Assistance. The resulting estimate was:

351,090 elementary students x $1,592/student	=	$ 558,935,280
254,220 high school students x $2,172/student	=	552,165,840
		$1,111,101,120

The figures are based on area limitations and allowable unit costs of the State-aid program and include fees, furniture and equipment, and site development. The estimate of over $1.1 billion compared closely with an estimate by Allan Post, Legislative Analyst.

1968 Estimate

In January, 1968, the Bureau of School Planning submitted a questionnaire survey to all California school districts. The findings indicate that approximately $400 million are needed to correct structurally unsafe California school buildings. A discrepancy of over $700 million dollars in the two estimates can partially be accounted for by:

(a) The 1962 report gave 3,414 pre-Field Act buildings in use. Districts reported only 1,688 such buildings in the 1968 survey. (This figure was corrected to to 2031.)

(b) In preparing figures for the earlier estimate, the Bureau of School Planning assumed that obsolete school buildings would be replaced with facilities of a quality comparable to those built under the State Aid Program. School districts in the 1968 survey gave cost estimates for money necessary to make minimal structural corrections. Many of these districts desire to retain educationally obsolete schools rather than to replace them with modern facilities.

A REPORT ON STRUCTURALLY UNSAFE SCHOOL BUILDINGS

prepared by
Bureau of School Planning
California State Department of Education

March 15, 1968

A 1967 amendment to the Education Code (Section 15513) created by Assembly Bill 450, named the Bureau of School Planning, State Department of Education, as the agency responsible for reporting to the Legislature on the progress made by school districts to correct structural deficiencies of their pre-1933 school buildings.

To comply, the Bureau of School Planning developed a survey questionnaire during November 1967 which was designed to identify:

1) the name of each district with pre-1933 buildings.
2) the number of non-rehabilitated pre-1933 buildings presently in use by the districts.
3) whether or not these older buildings have been structurally surveyed.
4) the estimated cost to remedy each building.
5) whether the board of trustees has adopted a plan of action for correcting these buildings.
6) the funds available to the district for correcting these buildings.
7) the results of elections held by the districts to obtain the funds necessary to remedy these buildings.

The county school superintendents cooperated by distributing the questionnaires to their respective districts and by collecting the surveys which were then mailed to the Bureau. The following data represents the Bureau's analysis of this survey data:

ANALYSIS OF SURVEY DATA ON PRE-1933 CALIFORNIA SCHOOL BUILDINGS

A. SURVEY DISTRIBUTION

Districts	Number	Percent
School districts receiving questionnaires	1165	
Districts that returned survey data	928	79. 66 *
Districts that did not reply	237	20. 34

* Approximately four out of five districts returned the questionnaire forms with the required information. Almost all major city districts complied with well-documented data.

B. PRE-1933 BUILDINGS

Districts	Number	Percent
Districts without pre-1933 buildings	515	55. 5
Districts using pre-1933 buildings	413	44. 5
Total number of pre-1933 school buildings	1688*	

* An inventory taken of school facilities in 1962 by the Bureau of Research, State Department of Education, determined that there were 3,414 pre-Field Act school buildings in California. If our present survey showing a total of only 1,688 uncorrected buildings is valid and if this figure is increased to 2,031 on the assumption that districts not reporting have a similar ratio of pre-1933 buildings as districts which did report, then the conclusion must be that approximately 1,383 of these buildings have either been rehabilitated or abandoned since 1933.

C. DISTRICTS THAT HAVE OBTAINED STRUCTURAL ANALYSES

Districts	Number	Percent
Districts using pre-1933 buildings	413	
Districts that have structural analyses	272	65. 87*
Districts that have not obtained analyses	115	27. 86
Districts in the process of obtaining analyses	26	6. 27*

* Approximately 72% of districts with pre-1933 school buildings in use either have obtained structural survey information or are in the process of acquiring this information. Unfortunately, some districts reported that they obtained their analysis in the years immediately after the 1933 Long Beach earthquake and one must question whether such reports are still valid after more than 30 years.

D. GOVERNING BOARD'S PLAN OF ACTION

Districts	Number	Percent
Districts using pre-1933 buildings	413	
Districts that have adopted a correction plan	245	59. 32*
Districts that have not adopted such a plan	125	30. 27
Districts that did not report on this item	43	10. 41

* Approximately 60% of districts using pre-1933 buildings have adopted a plan of action. This requirement was enacted into law on May 24, 1967 — a time period of about eight months.

E. ELECTION RESULTS

Proposition	Passed	Failed
Construction bonds	24	20
Tax rate increase	3	11
Abandon buildings	5	6

Of the 245 boards that have adopted a plan for correcting their pre-1933 school buildings, only 44 districts reported that they have held elections to obtain the necessary funds. This is undoubtedly because there has not yet been sufficient time for many districts to obtain cost estimates and other information necessary to present a bond or tax issue before their electorate.

F. AVAILABLE FUNDS FOR REMEDYING PRE-1933 BUILDINGS

Source of Funds	Amount
District monies including unused bonding capacity	$124,926,070
Amount of State-aid eligibility	60,896,994
Federal funds	712,973
Other	9,760,178

REPORTED TOTAL $196,296,215

Although districts reported a total amount of available monies that exceeds 196 million dollars, an analysis of this data demonstrated that many districts reported their total bonding capacity rather than the amount estimated to be necessary for correcting their pre-1933 buildings. Also, many districts reported the amount of their total State-aid eligibility even though, in many instances, this far exceeds the amount required for remedying their schools. Since neither a district's bonds nor monies eligible under the State-aid program is available to other districts, these figures were corrected and are now assumed to be approximately:

Source of Funds	Amount
District monies including unused bonding capacity	$105,445,745
Amount of State-aid eligibility	16,018,186
Federal funds	712,973
Other	8,472,200

CORRECTED TOTAL $130,649,104

G. ESTIMATED REMEDY COST OF PRE-1933 BUILDINGS

Monies	Amount
Estimated cost of remedy (survey report)	$274,658,714 *
Monies available (survey report)	130,649,104 *
TOTAL REPORTED DEFICIT	$144,009,610 *

* The estimated cost of remedying all of California's pre-1933 school buildings which fail to meet the structural design standards of Title 21 was obtained from the survey questionnaires. These figures are not complete. The deficit of over 144 million dollars represents an amount determined by reports from 928 districts out of 1165 total districts. If one assumes that the districts not reporting have a similar ratio of pre-1933 school buildings as those districts which did report and a multiplier of 100/79. 66 is used, the approximate cost for remedying these buildings becomes:

Monies	Amount
Approximate cost of remedy (all districts)	$344,789,000
Approximate monies available (all districts)	164,008,000
REVISED DEFICIT	$180,781,000

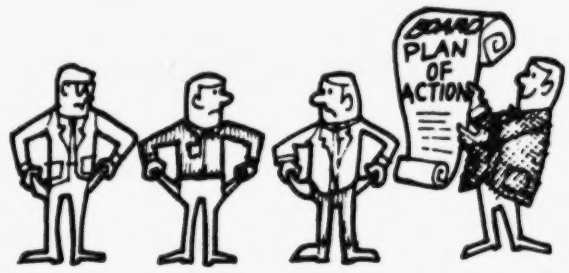
Of the 928 districts that returned survey information, 104 districts were unable to give an estimate for the cost of rehabilitating or replacing their pre-1933 buildings either because a structural survey and estimate was not obtained or because the estimate is still in the process of being prepared. This represents 269 buildings out of a total of 1688 buildings, or approximately 15. 94 percent, which have no cost estimate.

Assuming that buildings without cost estimates for correcting deficiencies will average approximately the same amount to remedy as the 84 percent which have been surveyed, the figures become:

Monies	Amount
Estimated cost of remedy (all buildings)	$399,748,000
Monies available (all buildings)	190,151,000
ESTIMATED TOTAL DEFICIT	$209,597,000

Chapter III
ASSEMBLY BILL 450 (1967)
An Interpretation

CHAPTER III



ASSEMBLY BILL 450 (1967)
An Interpretation

Assembly Bill 450 is now part of the California Education Code, Part 3, Division 11, Chapter 2, Article 4, Sections 15501 - 15515. The material in this chapter is an interpretation of A.B. 450 by the Bureau of School Planning, State Department of Education.

The Legislature is cognizant that California presently has a dual level of safety for its school children. Many pupils are housed in buildings which do not meet the safety standards of Title 21, while other children have the protection of buildings designed to comply with these safety standards. In recognition of this problem, the Legislature enacted Assembly Bill 450 into law as an urgency statute effective immediately upon signature of the Governor on May 25, 1967.

DIGEST OF ASSEMBLY BILL 450

This bill:

1) Reaffirms support for the concept of structural safety standards (Title 21).
2) Expresses the intention that local school districts shall adopt a plan for the orderly repair, reconstruction, or replacement of those school buildings constructed prior to 1933 which have not been replaced or improved structurally to meet minimum earthquake safety standards, and provides methods by which local school districts may finance such required construction by use of local funds. This is called the governing board's plan of action.
3) Requires that school districts place a report on file with the Bureau of School Planning, State Department of Education, within six months after the school board receives a structural survey report on pre-Field Act buildings. This report of the structural investigation shall include:
   a) A summary of the survey.
   b) A summary of previous elections held to obtain monies for correcting the deficiencies of unsafe school buildings.
   c) A summary of all district action taken relative to achieving safe school buildings.
   d) A statement of the board's intent to repair, reconstruct, or replace inadequate buildings. This statement shall give the approximate date when action will be taken to proceed with the construction necessary to correct or replace each unsafe building within the district.
4) Requires that the Bureau of School Planning summarize and report to the Legislature every two years, commencing with the 1968 regular session, the data submitted by the districts relating to the governing board's plan of action to correct unsafe school buildings.

GOVERNING BOARD'S PLAN OF ACTION

A governing board's plan of action is a procedure requiring the following steps:

Step 1 An examination and report of all pre-1933 school buildings in the district shall include:

1) A structural survey by a licensed structural engineer, a licensed architect, or by the Department of General Services sufficiently early to permit the submission of the survey report and estimates of replacement or rehabilitation costs on or before January 1, 1970.

2) A statement by the person or agency making the structural survey that each of the buildings examined is safe or unsafe for school use.

3) An estimate to replace or rehabilitate school buildings reported to be unsafe. If the report states that the building examined is unsafe for school use, the board of trustees must immediately have an estimate prepared of the cost necessary to replace or rehabilitate the building so that it meets the structural safety requirements of Title 21. The estimate must be based on current costs and it may include other costs to reflect modern educational needs. It must also include an estimate of the replacement cost based on the standards established by the State Allocation Board for area per pupil and cost per square foot. The required estimates must be received by the board of trustees on or before January 1, 1970.

Step 2 An adoption of a plan for the repair, reconstruction, or replacement of unsafe pre-1933 school buildings must contain a statement of intention to repair, reconstruct, or replace each school building built prior to 1933, and the approximate dates that this action will occur. This plan must be filed with the Bureau of School Planning, State Department of Education, as explained in Digest of Assembly Bill 450, number 4).

Step 3 A board of trustees, upon receiving estimates of the cost to replace or rehabilitate a school building found to be unsafe, shall take the following action:

1) If the school district has sufficient funds to finance the repair, reconstruction, or replacement of unsafe school buildings and such funds do not represent the proceeds of a school bond issue previously authorized for other purposes, the board of trustees, within six months of receipt of the report, must initiate action for the repair, reconstruction, or replacement of the unsafe buildings.

2) If the school district does not have sufficient funds to finance the repair, reconstruction, or replacement of unsafe school buildings the board of trustees, within six months of receipt of the report, must call an election submitting to the voters of the school district three propositions as follows:

   a) Authorization of school bonds in an amount of the estimate to replace, repair, or reconstruct the unsafe buildings, whichever the board of trustees shall select.

   b) Authorization of an increase in the maximum school tax rate for such length of time as will permit raising sufficient funds for repair, reconstruction, or replacement of the unsafe buildings.

   c) Abandonment of the buildings and the use of tents or other temporary structures for school purposes in lieu of the buildings abandoned.

The law provides that neither proposition a) or b) shall be required to finance the entire repair, reconstruction, or replacement program of the school district, but must at least provide funds for commencement of such repair, reconstruction, or replacement consistent with the plan of the board of trustees. The resolution ordering and the notice calling the election must specify the building or buildings initially proposed to be repaired, reconstructed, or replaced.

Step 4 Following an election to obtain funds for repairing, reconstructing, or replacing pre-1933 school buildings, the board shall take the following actions:

1) If at the election, two-thirds of the ballots are in favor of the issuance of school bonds, the bonds shall be authorized and the proposition calling for an increase in the maximum tax rate of the district shall be disregarded.

2) If the school bonds proposition fails but a majority of voters approve the maximum school tax rate proposition, the school tax rate increase shall be authorized. The board of trustees must increase the school tax rate and use these proceeds solely for the repair, reconstruction, or replacement of unsafe school buildings.

3) If neither the school bond or maximum school tax increase propositions are approved by the voters, the board of trustees must again submit these proposals to authorize the issuance of bonds and to increase the school tax rate no later than five years following the last submission. The result of the voting on the proposition to authorize the use of tents or other temporary structures shall be considered by the board of trustees as an advisory vote only. Tents or such temporary structures may be used to the extent that such use is deemed necessary.

A.B. 450 contains a provision which states that if the board of trustees complies with this law, no member of the board shall be held personally liable for injury to persons or damage to property resulting from the fact that a school building was not constructed under structural safety standards first enacted in 1933. This immunity from liability begins the moment the board of trustees orders the examination of the structural condition of school buildings constructed prior to 1933.

SUMMARY

It is intended that all deficient pre-1933 school buildings will have been repaired or replaced by 1983.

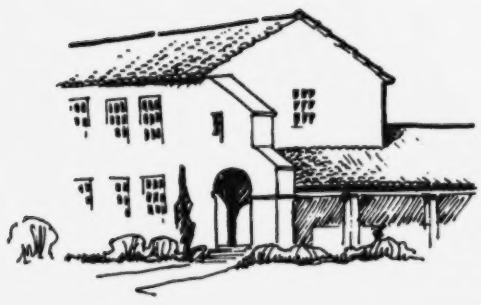
The governing board of any district shall have taken action for the repair or replacement of its pre-1933 buildings as required by the board's plan of action by January 1, 1970.

A district which fails to pass bonds or tax elections for funds to initiate its governing board's plan of action shall resubmit the proposals to the electorate no later than 5 years following the last submission.

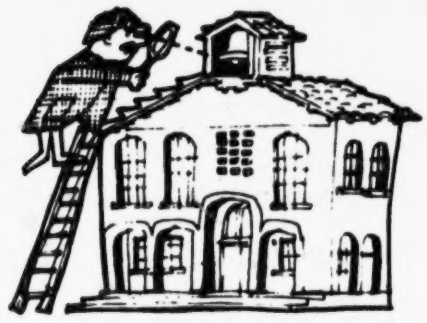
Addendum

The first copies of "Cracks in the Belfry" were reproduced and distributed in March 1968. On July 18, 1968, Assembly Bill 420 was signed into law by Governor Reagan. This bill adds Section 15516 to the Education Code and reads as follows:

> 15516. No school building examined and found to be unsafe for school use pursuant to Section 15503 and not repaired or reconstructed in accordance with the provisions of this article shall be used as a school building for elementary and secondary school or junior college purposes after June 30, 1975



Chapter IV
SURVEY EXPECTATIONS



CHAPTER IV

SURVEY EXPECTATIONS

School buildings constructed in the twenty-year period preceding the enactment of the Field Act in 1933 have many features in common. This was an era when architects relied heavily on prototype plans. These were generally two-story, in-line corridor buildings with standardized classrooms, an auditorium, and adjunct facilities such as offices, a central lobby, and minimum restroom accommodations. The engineers also applied standardized solutions because the construction techniques and materials available were limited. Since most of these schools are all-of-a-type, it is possible to anticipate some of the findings of a structural investigation before the engineers have actually probed, opened up the wall, roof, and floor cavities, and made their diagnosis.

A school board that requests a survey will most certainly receive a report stating that the building under investigation does not meet the design provisions of Title 21 to enable it to resist horizontal seismic forces, and there will probably be a listing of other major deficiencies. Engineering criteria under Title 21 require higher standards of design in school buildings than was true in earlier days.

CHARACTERISTICS OF A HYPOTHETICAL PRE-FIELD ACT BUILDING

1) Early California style of architecture distinguished by hip or gable roof covered with Spanish tile; decorative plaster mouldings at cornices and entry doors; and a bell tower or some similar identifiable feature. (Many of these buildings used cavity brick or masonry walls in lieu of plaster over concrete.)
2) Two-story building with attic and basement or an additional lower floor. (Floor elevation is below grade.)
3) Floor plan of a simple E, I, H, or L shape placed on the site with reference to the frontal street to achieve a formal facade.
4) Large entry lobby and wide interior corridors, stairways, or ramps.
5) Interior spaces with very high ceilings subdivided with bearing walls. (These rooms had little or no potential for remodeling.)
6) Foundations with continuous footings for supporting exterior and corridor walls and with wood posts on concrete piers to give intermediate support for lower floor beams.
7) Timber wood trusses; wood ceiling and floor joists with diagonal sheathing over the rafters and floor joists.

8) Exterior walls of reinforced concrete up to twelve inches thick; wood stud interior bearing walls with plaster over wood lath.

9) Heating system using steam boiler and steam radiators.

10) Incandescent artificial lighting using suspended fixtures (concentric ring or glass bowl fixture).

PROBABLE INVESTIGATIVE FINDINGS

1) Plaster and concrete cracks in walls and ceilings that indicate over-stressing.

2) Deteriorating mortar between bricks or masonry and inadequate ties.

3) Core samples of concrete construction which indicate compressive strengths considerably below 1500 pounds per square inch with only limited reinforcing. (There are many exceptions. Some older buildings have concrete walls and foundations that test out at strengths exceeding the requirements in Title 21.)

4) Timber construction in good repair. (Many buildings of this period used lumber of better quality than is available today; however, there may be evidence of wet or dry rot and in some localities there may be extensive damage by termites or wood boring insects.)

5) Roof tiles improperly anchored.

6) Insufficient diaphragm to tie together the building roof, floor, and wall components.

7) Rooms poorly lighted and windows without adequate sun or glare control.

8) Heating system that produces chronic overheating and high humidity in winter (windows are the only means of ventilation).

9) Plumbing generally inadequate (classrooms are without lavatories and there are no provisions for hot water in restrooms).

10) Construction of interior walls and ceilings (plaster bonded to wood lath) does not meet requirements of Title 21.

RECOMMENDATIONS FOR MODERNIZATION

1) Remove roof tile and replace with some type of light roofing material such as asbestos shingles.

2) Provide plywood diaphragm over roof and ceiling joists.

3) Double or reinforce roof and ceiling joists with strong-backs in attic area.

4) Rebolt sills at ceiling and roof joists and provide new connecting ties between walls and roof trusses.

5) Add joist ties and blocking between concrete walls and floor joists.

6) Remove wood lath and plaster from ceilings and replace with gypsum board and glu-up acoustical tile, or with a suspended ceiling system of T-bars, integrated lighting fixtures, and acoustical tile.

7) Remove all wood lath and plaster from interior walls and replace with taped and painted gypsum board.

8) Retrim and replace moldings at doors, windows, and other openings.

9) Replace wood windows with aluminum sash.

10) Add new chalkboards in classrooms.

11) Refinish floors and surface with vinyl or asphalt tile.

12) Replace ramps with stairs (if required by fire code) and provide proper panic hardware at exits.

13) Tile walls in restrooms.

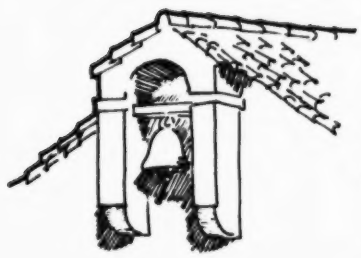
14) Provide fire sprinkler system in corridors and exit ways.

15) Repipe existing steam heating system, provide new boiler, and add a mechanical exhaust system in each classroom.

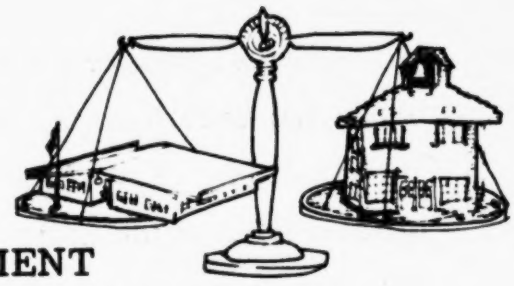
16) Rewire electrical distribution system using metal conduit, add one outlet on each interior classroom wall, and replace existing fixtures with a low-brightness, indirect fluorescent lighting system.

17) Use vinyl wall coverings in areas of hard usage such as corridor walls and classroom walls. (Use of fibre board under vinyl covering where tackboard is desired.)

18) Repaint all interior and exterior unfinished or previously painted surfaces.



Chapter V
REHABILITATION VERSUS REPLACEMENT



CHAPTER V

REHABILITATION VERSUS REPLACEMENT

Harry Charles Schwilke, consultant, Bureau of School Planning, State Department of Education, has had a close working relationship with many school districts confronted with the problem of correcting potentially unsafe school buildings. This association led to his investigation into the history of actions taken by boards of trustees in determining whether to rehabilitate or to replace unsafe buildings. The following material was extracted with Dr. Schwilke's permission from his doctoral dissertation which was copyrighted in 1966 under the title "Decision Making in School Building Rehabilitation."

STATEMENT OF THE PROBLEM

The purpose of this study was to determine the factors considered in rehabilitating school buildings in selected southern California school districts. Specifically, an attempt was made to find answers to the following research questions:

1) What factors should be considered in decision making when districts face the problem of whether to rehabilitate or to replace a school facility?
2) What was the cost of rehabilitation as compared to the estimated cost of new construction?

METHOD OF THE STUDY

Since available information fails to identify those factors which are crucial to school boards' decisions when faced with the need to rehabilitate or replace school facilities, it was decided to determine such factors by examination of records and interview of officials of districts which have made these decisions.

Official state records show that 71 school districts in southern California have undertaken rehabilitation studies. Within these 71 districts, 83 schools were identified as having completed rehabilitation studies since 1960.

To achieve the purposes of this inquiry, the school district's records were investigated. These records contained the estimated costs of rehabilitation versus new buildings, type

of facilities, square footage, date of original construction, site acreage, present and projected enrollments, and the estimated percentage rehabilitation costs would be of new construction. Actual contract costs in the district's records were checked against the official files of the State of California, Office of Architecture and Construction. Where discrepancies occurred, the figures from the latter source were used.

A structured interview was subsequently conducted with the superintendent and the assistant superintendent of each of the school districts in which the rehabilitated schools were located to secure data concerning factors affecting the decision to rehabilitate.

INTERVIEWS

The following statements or questions were used to elicit reactions from school personnel involved in the decision to rehabilitate the 21 schools: (See Table I for responses.)

1) This school was rehabilitated because the cost was less than to replace.
2) The age of the building was a factor in determining whether to rehabilitate or to replace the building.
3) This school was rehabilitated because the site was inadequate for the educational program.
4) This school was rehabilitated because it was considered a financial advantage to the district.
5) The desirability of rehabilitation versus replacement was a factor in making the decision to rehabilitate.
6) The old building was still good and should be brought up to present day standards.
7) The feeling in the community was a factor in making the decision to retain the old building.
8) There have been complaints about the inadequacies of the old building by the staff.
9) The old building blends into the surrounding community.
10) The pressure in the community to have equal schools for all children was of importance in making the decision to rehabilitate.
11) To justify the new schools in the district, it is necessary to upgrade older schools.
12) The decision to rehabilitate was based on engineering studies that made it mandatory either to rehabilitate or to abandon the school.
13) The decision to rehabilitate was based on findings that the existing facilities were educationally inadequate.
14) The decision to rehabilitate was based on educational program changes.
15) A change in the board and/or administration was the basis for the decision to rehabilitate.

Table I

RESPONSES TO QUESTIONNAIRE STATEMENTS 1 THROUGH 15

STATEMENTS	A statement's importance as a factor in the decision to rehabilitate rather than to replace the building. (Numbers are weighted * to indicate degree of importance.)	
	At the time the decision was made	If the decision could be made again
1	174	63
2	18	9
3	153	162
4	192	105
5	87	60
6	63	39
7	90	63
8	213	213
9	63	57
10	114	87
11	120	108
12	264	210
13	237	258
14	6	9
15	0	0

* Weight assigned:
3 = Very important
2 = Of some importance
1 = Not very important

Table II

SUMMARY OF RESPONSES TO QUESTIONS 16 THROUGH 25

Question	Yes	No
16. Is the school a part of the district master plan?	108	—
17. Was this building originally built to house the present enrollment at this site?	71	37
18. Will the growth patterns within the district change the projected enrollment at this site?	12	96
19. Is the site adequate in size for the projected enrollment?	51	57
20. Is there an age of a building when rehabilitation should not be considered? If so, what age?	72	36

Age in years	20	25	30	35	40
Number of respondents	1	20	40	6	5

21. Is there a percent of the replacement cost that should not be exceeded for rehabilitation? If so, what percent?	93	15

Percent	25	30	40	50	55	60	65	70
Number of respondents	2	6	2	39	11	12	9	12

22. Does the economic condition of the district have a direct effect on the decision to rehabilitate or replace school buildings?	47	61
23. Were published formulas or survey forms used to make the decision to rehabilitate or replace the buildings?	—	108
24. Do you feel the opinions you have expressed are about the same as those of the school staff and board?	108	—
25. Are other factors that should be considered when making the decision to rehabilitate or replace a school building taken into account? If so, please comment.		

ADDITIONAL COMMENTS TO QUESTION 25

Question 25 was included to elicit opinions concerning other factors that affect the decision to rehabilitate or replace old school buildings. Some of these comments, recorded under the headings of Economic, Psychological, Political, and Educational factors, were as follows:

Economic

New buildings use less square footage than rehabilitated ones.

Rehabilitation cost estimates are not reliable. The building can be replaced for less money than it can be rehabilitated, and correction of major maintenance items such as painting and roof repairs will not be required.

Rehabilitation involves more than just educational compromises. Desirable features such as air conditioning have to be eliminated in the rehabilitation estimates to stay within defensible cost estimates.

The maintenance older buildings have received over the years will influence a decision as to the feasibility of rehabilitation.

Psychological

Teachers like air conditioned classrooms, but if they have to sacrifice the large window areas they would rather stay in the old school.

Sometimes the old building is important as a landmark in the community.

The old buildings look better than some of the new ones which resemble warehouses or prisons.

Political

Auditoriums are rehabilitated because district standards do not allow for the construction of new auditoriums in elementary schools or on the same sites.

Rehabilitation of auditoriums is often more convenient than replacement because it is not necessary to conform with the local regulations for on-site parking.

Educational

Older buildings provide less flexibility.

Rehabilitation should not be considered if the building is not properly located on the site in relation to other buildings.

Cost is not as important as educational adequacy.

Many rehabilitated buildings do not lend themselves to modern educational programs.

FACTOR 1 - COSTS

Table III shows the comparison between estimated rehabilitation costs and replacement costs. Table IV compares estimated and actual rehabilitation costs with estimated replacement cost. It will be noted that the actual rehabilitation costs were considerably more than the estimated rehabilitation costs — as much as 195% more. One of the major reasons for this disparity between the estimated and the actual cost is the difficulty in determining precise labor costs. Some of the districts investigated their proposed projects in great detail before making estimates for rehabilitation. For example, core samples were taken to determine if the existing concrete would meet present-day compression tests. Access panels were cut in the walls, floors, and ceilings for appraisal of the structural, mechanical, plumbing, and electrical work that would be required to satisfy the various codes. Contractors bidding these projects were able to identify the work they were required to perform and could make more realistic bids. In the three schools (No. 3, No. 5, and No. 41) where this procedure was followed, the merits are reflected in the low percentage increases of actual contract cost over the estimate (9. 5%, 2. 3%, and 6. 6% respectfully). Table IV shows an average increase of 43. 8% from the estimated to the actual contract cost of the 21 schools rehabilitated.

FACTOR 2 - SIZE OF THE PROJECTS

Preliminary investigation into the square footage needed to replace the older buildings raised the question as to whether more or less area would be required if the same number and kinds of teaching stations were replaced. Some school districts prepared plans to determine the square footage necessary to replace existing buildings. In all cases where the same number and types of teaching stations were considered for replacement, an average of 10. 6 percent less square footage was used.

FACTOR 3 - EDUCATIONAL ADEQUACY

Adequacy is integrally related to the educational program and policies of each school district rather than dependent upon arbitrary standards applicable to all school situations. In planning for the rehabilitation of a school, an attempt must be made to introduce the kinds of space and flexibility necessary to accommodate new concepts of the learning process emphasizing individual rates of progress. Large open spaces that can be readily modified are the keynote to modernization. If the school's structure requires interior bearing walls that prevent this flexibility, then educational adequacy is severely compromised. The introduction of better lighting, air conditioning, and modern furnishings will only produce partial results. The educational process will still be confined to the limitations of the box.

Table III

THE 62 REPLACED SCHOOLS

Comparison of Estimated Rehabilitation Costs and Replacement Costs

School Number	Estimated Rehabilitation Cost	Replacement Cost	Rehabilitation Percentage of Replacement
3	$109,995	$109,250	100.7
6	412,522	498,295	82.8
7	627,084	602,600	104.1
8	354,485	396,153	89.5
11	116,151	105,759	109.8
12	110,918	113,767	97.5
13	242,191	296,700	81.6
15	331,934	445,826	74.3
16	293,910	326,600	90.0
17	80,184	132,372	60.6
18	484,932	457,700	106.0
19	426,650	420,900	101.4
20	345,163	387,656	89.0
21	236,194	238,365	99.1
22	100,781	114,396	88.1
23	696,861	697,290	99.9
26	241,797	244,375	98.6
27	332,182	431,343	77.0
28	71,233	97,484	73.1
29	43,257	95,786	45.2
30	110,643	84,036	131.7
31	177,128	202,417	87.5
32	118,020	145,793	81.0
33	44,413	61,920	71.7
34	98,775	127,685	77.4
35	397,062	521,280	76.1
36	476,810	439,349	108.5
37	80,721	123,794	65.2
38	358,389	388,761	92.2
39	32,907	32,823	100.3
40	161,136	141,846	113.5

School Number	Estimated Rehabilitation Cost	Replacement Cost	Rehabilitation Percentage of Replacement
42	$108,160	$126,380	85.6
43	223,270	194,911	114.5
44	272,000	350,000	77.7
46	393,582	408,981	96.2
48	229,950	296,600	77.5
49	578,026	567,358	101.9
51	229,519	253,792	90.4
52	1,292,369	1,700,850	76.0
53	117,121	270,710	43.3
54	203,390	260,000	78.2
55	197,166	251,000	78.6
59	199,642	208,150	95.9
60	3,976,996	2,875,120	102.6
61	4,658,369	4,628,253	100.7
62	381,374	449,006	84.9
63	512,695	625,612	82.2
64	2,329,607	2,593,802	89.8
65	1,250,216	1,542,201	81.1
66	512,520	458,962	111.7
67	1,295,164	2,177,477	59.5
68	380,117	568,456	66.9
69	278,210	298,200	93.3
70	1,215,863	1,441,975	84.3
72	1,142,639	1,205,868	94.7
73	176,784	189,347	93.4
74	500,420	581,235	86.1
75	100,050	128,460	77.9
76	830,221	1,300,512	63.8
79	433,430	381,763	113.5
82	225,786	279,250	80.9
83	756,320	836,450	90.4

Table IV

THE 21 REHABILITATED SCHOOLS

Comparison of Estimated and Actual Rehabilitation Costs with Replacement Costs					
School Number	Estimated Rehabilitation Cost	Actual Rehabilitation Contract Cost	Estimated Replacement Cost	Percent of Actual over Estimated Rehabilitation Cost	Percent Rehabilitation Cost is of Replacement Cost
1	$205,922	$225,400	$279,995	9.5	80.5
2	268,451	458,436	534,175	70.8	85.8
4	305,055	339,582	355,706	11.3	95.5
5	218,592	223,575	208,150	2.3	107.4
9	283,611	336,197	389,600	18.5	86.3
10	248,167	400,559	399,050	61.4	100.4
14	350,778	402,873	562,350	14.9	71.6
24	340,094	378,281	578,440	11.2	65.4
25	276,751	312,326	446,430	12.9	69.9
41	331,907	353,850	390,237	6.6	90.4
45	668,696	841,717	1,553,802	25.9	54.2
47	382,585	552,100	565,933	36.5	92.2
50	139,219	266,996	371,438	91.8	71.9
56	132,000	227,100	232,000	72.1	97.9
57	95,659	148,695	178,200	55.4	83.4
58	141,947	237,189	190,675	67.1	124.4
71	188,208	253,567	261,118	34.7	97.1
77	79,388	97,000	140,050	22.2	69.3
78	76,539	139,250	132,500	81.9	105.1
80	263,273	776,675	915,732	195.0	84.8
81	330,000	386,400	526,090	17.1	73.4
				Mean 43.8	Mean 86.0

SUMMARY

This report was based on the case histories of 71 school districts which investigated 83 school buildings constructed prior to 1933 to determine whether the buildings should be rehabilitated or replaced. The boards of trustees decided to replace 62 of these school buildings and to rehabilitate 21 of them.

Some facts concerning the 21 rehabilitated projects are:

1) Four projects exceeded replacement costs by more than 100 percent.
2) Fourteen projects exceeded replacement costs by more than 80 percent.
3) The actual cost of all rehabilitated projects exceeded the cost estimate from 10 percent to 195 percent.

In personal interviews with 108 people directly connected with making the decision to replace or to rehabilitate, Dr. Schwilke found:

1) The basic reason for the decision to replace or rehabilitate a school was the cost estimate.
2) Rehabilitation always required more floor space than would have been required to provide equal facilities with new construction.
3) Rehabilitation always resulted in serious educational compromises. The older buildings could not be adapted to meet current educational program requirements which are dependent upon space flexibility.
4) Desirable features, such as air conditioning, could not be provided for the rehabilitated buildings within defensible cost estimates.

Two factors which often influenced the decision to rehabilitate rather than to replace the school buildings were:

1) Many school districts could not afford to build auditoriums in new elementary schools and preferred to have a rehabilitated auditorium and school rather than a new school without an auditorium.
2) Most metropolitan areas require a ratio of parking spaces to auditorium seats when a new auditorium is built. If the auditorium is rehabilitated, this code provision does not apply.

Chapter VI
DETERMINING EDUCATIONAL ADEQUACY

CHAPTER VI

DETERMINING EDUCATIONAL ADEQUACY

Look around your town. Is something missing — maybe the Main Street School? Few people are aware that schools, like people, have a life expectancy of three score years. Many school buildings in California are either torn down or rehabilitated each year.

At a planning institute in 1963, Charles W. Bursch, former chief of the Bureau of School Planning, made the following statement: "There is one over-riding consideration — a kind of cosmic force, if you please — that would be well for us to bear in mind. I speak of the unrelenting pressure of Californians to provide new public schools that are up-to-date when produced, and to up-date school plants when the need appears.... While it is true that during the financing of a given school construction program this great force is tempered by limiting financial considerations, it is also true that as soon as a compromised school project is occupied, the great force is again at work to overcome as soon as possible the deficiencies brought about by the compromises. Living and working with this phenomenon is one of the outstanding memories of thirty years of work in the school plant field."

An additional pressure which may cause districts to appraise their older buildings has been added with the 1967 passage of Assembly Bill 450.

The first hurdle for most school boards and citizens is to admit that their schools are, in fact, obsolete. The classrooms in these schools may be so familiar that they are accepted without receiving critical appraisal. They may be the very schools which board members themselves attended twenty years or more ago. Nostalgia is very natural when recalling school years which were also the years of youth. Some of these older schools have considerable aesthetic appeal and most of them are symbols of tradition and permanency in the community. A realistic appraisal, however, may find that these schools are educationally and environmentally sub-standard — dark, drab interiors with black chalkboards and tobacco-brown desks, cabinets, floors, and trim. The rooms are often small by today's standards. Windows and lighting fixtures produce excessive glare, and the heating and ventilation may depend upon steam radiators and the opening or closing of windows.

An unrecognized commitment to modernization often comes with the decision to improve a heating plant, remodel toilets, repair plumbing, or replace a roof. Once a sizeable investment has been made in improving one of these items, it is too late to make a complete appraisal — a commitment to remodel has been made. This is a "piecemeal" approach to modernization and may result in perpetuating the life expectancy of an educationally inadequate structure. Before such improvements are authorized, it should be determined whether the building is functionally and economically salvageable.

Age should not be a consideration in the evaluation of older buildings. The actual physical condition of the building and its potential for remodeling are vastly more important. School buildings are made obsolete by maintenance neglect, upgrading of standards of construction with new materials and appliances, and educational change that requires new design concepts. One cannot realistically expect a forty-year-old school building to gain more than twenty to thirty years of additional life unless the remodeling is very extensive and includes new mechanical services and major plan alterations.

One of the factors to be considered in attempting to evaluate an older school is the difficulty of measuring it against a fixed scale or standard. Any measuring device will become obsolete with time, just as today's modern schools will someday be candidates for modernization. Nevertheless, it is imperative that some valid means be found for analyzing these schools. To meet this need, the Bureau of School Planning has prepared the following questionnaire. The criteria are based upon design factors that would be recommended for new construction because the assumption is made that if the building is to be renovated, it should serve educational needs as well as the modern school which might replace it for a similar expenditure of funds.

After the appraisal is made, recommendations for improving the educational adequacy should be reviewed and the cost of carrying out these recommendations should be estimated. Many buildings are not practical to remodel because of the cost factor. When the cost of rehabilitation approaches fifty percent of the cost of replacement, rehabilitation becomes a poor investment. This fifty percent factor has been substantiated by the "Great Cities Program for School Improvement," under sponsorship of the Ford Foundation, which documented the experience of many districts that have analyzed old school buildings for rehabilitation. The figure of fifty percent may be too conservative. Some experts feel that rehabilitation costs should not exceed forty percent of replacement costs.

The questionnaire is broken down into two parts. Part I is for the school administrator. He is given responsibility for preparing answers to questions under the headings:

A. Safety
B. Site
C. Space Organization and Adequacy
D. Maintenance
E. Auditorium

Part II of the questionnaire is for the teacher of each classroom or laboratory. The questions are non-technical, but they can provide critical information because they help to define how well such rooms serve the instructional needs of the school. The teachers are given the responsibility for answering questions under the headings:

A. Acoustics
B. Lighting and Electrical Systems
C. Heat and Ventilation
D. Equipment and Furnishings

Copies of this questionnaire can be obtained in the quantity desired by writing to:

Bureau of School Planning
State Department of Education
721 Capitol Mall, Room 346
Sacramento, California 95814

When the questionnaire has been completed for a given building, the superintendent can easily summarize the results for his board of trustees by compiling the answers to question 9 and question 10 in each category. (Question 9 is the rating of each factor such as safety, maintenance, acoustics, etc. ; and question 10 is the recommendation for correcting or improving each factor.) The result should be an accurate appraisal of the educational adequacy of the building.

PART I

A. SAFETY

Codes regulating the construction of schools are predicated almost totally on the concept of safety; therefore, the structural, engineering, electrical, and heating systems of the school are required to comply with Title 8 (Industrial Safety Laws), Title 19 (Fire and Panic Safety Standards), and Title 21 (Structural Safety) of the California Administrative Code. However, the safe use of a building also depends upon basic architectural decisions. The following questions are intended to define potential hazards resulting from poor architectural planning and material selection.

1) Do the streets adjacent to the school permit safe loading or unloading of buses or cars without interfering with through traffic? _____ yes _____ no

2) Is student pedestrian traffic to the school controlled at major intersections by crosswalks and traffic lights? _____ yes _____ no

3) Are the playgrounds fenced where they border streets, ravines, or similar hazards? _____ yes _____ no

4) Are the entrances designed without sills or other obstructions, and are stairs supplemented with ramps for wheeled vehicles? _____ yes _____ no

5) Is safety glass used in all low windows or glass doors adjacent to traffic areas? _____ yes _____ no

6) Have walk surfaces exposed to rain, all stair treads, and the floors in kitchens, shower areas, and toilet rooms been designed or treated to minimize slipping? _____ yes _____ no

7) Have adequate night lighting and emergency exit lights been provided at entrances, stair wells, interior corridors, passageways, and theater aisles? _____ yes _____ no

8) Has a recent inspection by a fire engineer shown that this building complies with the California State Fire Marshal's regulations? _____ yes _____ no

9) How would you rate this building as a safe facility for the housing of school children?

excellent _____ good _____ satisfactory _____ poor _____ not acceptable _____

10) What recommendations do you have for improving the safety of this building?

_____

_____

_____

B. SITE

Many sites occupied by pre-Field Act school buildings were acquired in an era when the criteria for school sites were limited to space for the buildings and minimal playgrounds. Some of these sites are not adequate for today's educational programs and will not allow for the development of outdoor physical education facilities or parking space.

1) What is the approximate appraised market value of the site? $_____

2) What is the approximate size of the existing site? _____acres

3) What are the net useable acres recommended by the Bureau of School Planning for a school of this enrollment? _____acres

(Refer to "School Site Analysis and Development" available from the Bureau.)

4) Is the site size adequate for:

	yes	no
a) additional buildings without crowding?	____	____
b) auto parking for staff, students, and public?	____	____
c) outdoor physical education programs and student assemblies?	____	____

5) Is the site well located in relation to student residences, parks, playgrounds, swimming pools, and other recreation centers? ____ yes ____ no

6) Are there special problems of drainage or erosion control? ____ yes ____ no

Comment: _____

7) Are there special problems related to the adequacy or condition of sidewalks, streets, and parking? ____ yes ____ no

Comment: _____

8) What is the neighborhood environment?

old residential ____ new residential ____ commercial ____ industrial ____ other ____

9) What is the ethnic composition of the area served by this school?

a) present: _____

b) probable future: _____

10) What recommendations would you make for improving the site development?

Comment: _____

_____

C. SPACE ORGANIZATION AND ADEQUACY

It is generally recognized that flexibility of interior space is essential to accommodate the schools of today and tomorrow. While most older buildings have a measure of adequacy just by possessing conventional classrooms, maximum utility can exist only in those schools that have instructional spaces designed to be used to maximum advantage throughout the day.

1) Is the building designed and located on the site for appropriate future expansion? _____ yes _____ no

   (Check location of corridors, stairways, and exits.)

2) Are the corridors and stairways adequate in width and without obstructions to permit uncongested student traffic flow? _____ yes _____ no

3) Is the amount of area in lobbies, corridors, and stairways excessive? _____ yes _____ no

   (Most modern schools require only 5% to 10% of the total floor area for circulation and none would be in excess of 20%.)

4) Does the building provide ample space for staff requirements such as dining, conferencing, and planning activities? _____ yes _____ no

5) Are the existing classrooms, laboratories, lecture rooms, and library of adequate size and correctly located with good plan layout? _____ yes _____ no

6) Are the interior non-bearing partitions in sufficient amount and located so that they can be removed to achieve a more functional plan? _____ yes _____ no

7) Does the district foresee a need for rooms of various size to accommodate patterns of instruction utilizing large and small groups? _____ yes _____ no

8) In this _____ story building, what are the typical ceiling heights? _____ feet

9) How would you rate the plan organization and use of space in this building?

   excellent _____ good _____ satisfactory _____ poor _____ not acceptable _____

10) What recommendations do you have for improving the spatial organization?

    Comment: _____

    _____

    _____

D. MAINTENANCE

The selection of materials and equipment determines the future maintenance and operation costs of a building. Consequently, to achieve economy the initial cost of materials must be weighed against their durability. The development and improvement of building materials has been so complete in the last two decades that few of the materials used in the construction of a school today would be found in a pre-Field Act building, whether it be the interior walls, floors, ceiling, furniture, or the lighting and air conditioning appliances.

1) Is the building constructed with exterior materials that require little or no maintenance? _____ yes _____ no

2) Are the interior walls and floors of the classrooms and toilet rooms constructed with materials which require little or no repainting or maintenance? (Check condition of floors and stairs.) _____ yes _____ no

3) Are the plumbing and utility lines protected from electrolysis and corrosion? _____ yes _____ no

4) Do the plumbing lines and fixtures give evidence of a need for costly repairs or extensive maintenance? _____ yes _____ no

5) Is the condition of the existing roof good enough to provide a minimum of ten years additional service? _____ yes _____ no

6) Has the sash been replaced with the aluminum puttyless type window that requires little painting or maintenance? _____ yes _____ no

7) Are the outdoor parking areas, curbing, sidewalks, and hardcourt areas in good repair and surfaced with permanent-type materials? _____ yes _____ no

8) Are the grounds landscaped with trees, shrubs, and ground cover, and provided with yard sprinklers for easy maintenance? _____ yes _____ no

9) In terms of maintenance, how would you rate this building?

excellent _____ good _____ satisfactory _____ poor _____ not acceptable _____

10) What recommendations do you have for reducing the maintenance of this building?

Comment: _____

_____

_____

E. AUDITORIUM

School districts today seldom build the traditional community auditorium — an important element in many older schools. Priority has been given to the construction of classrooms and other instructional spaces. Districts which have these auditoriums are reluctant to abandon them because it is unlikely that they can be replaced. It is, therefore, imperative that a careful evaluation be made of these auditoriums to determine if they shall be retained and how they can be rehabilitated to better serve today's educational needs.

1) What is the seating capacity of this auditorium?

lower floor _____ seats

balconies _____ seats

TOTAL _____ seats

Has the State Fire Marshal's office approved the balconies for occupancy?

____ yes ____ no

2) How many hours per week is this auditorium in use?

_____ hours per week

(Count only those hours when it is filled to at least 50% capacity.)

3) What major functions does this auditorium serve?

large lecture groups _____ A. V. presentations _____ public recreational uses _____

rehearsals and performances for public audiences _____ assemblies _____ band _____

orchestra _____ choral _____ dramatics _____ physical education _____ films _____

food service _____ other (identify) _____

4) Are the stage, off-stage areas, and equipment adequate for stage productions?

____ yes ____ no

(Such items as controlled concert and stage lighting; moveable backdrops and scenery; staging areas for performers; toilets and dressing rooms; and adequate storage for props and costumes are essential to theater productions.)

Comment on deficiencies: _____

_____

_____

5) Is the auditorium properly designed and equipped for presenting films and other audio-visual media?

____ yes ____ no

(Provision for house lights or dimmers; adequate sized projection screen; amplified sound system; and outlets for T. V. cameras, monitors, and film projectors are required.)

Comment on deficiencies: _____

_____

_____

6) Is the type of seating provided in this auditorium appropriate to the functions served? ____ yes ____ no

(Such options as flat or sloping floors; fixed or moveable seating; upholstered or hard seats; seats with or without tablet arms; and the seat spacing between rows can drastically effect the comfort and efficiency of a school auditorium.)

Comment on deficiencies: _____

_____

_____

7) Do you consider this auditorium acoustically satisfactory for the following functions:

instrumental music groups?	____	____
choral groups?	____	____
dramatics?	____	____
lectures?	____	____

Are the acoustics satisfactory when the house is:

nearly empty?	____	____
at half capacity?	____	____
at full capacity?	____ yes	____ no

8) Can you perceive accurately the separate sounds of instruments or voices when seated in various audience locations? ____ yes ____ no

9) How would you rate this auditorium?

excellent _____ good _____ satisfactory _____ poor _____ not acceptable _____

10) What recommendations do you have for improving or modernizing this auditorium?

Comment: _____

_____

_____

_____

PART II

A. ACOUSTICS

To ask a teacher for an opinion about her acoustical environment should not be interpreted as a challenge to find faults, but rather as an attempt to accurately access the acoustical quality of the classroom and to identify major noise disturbances. The answers, of course, will be subjective and vary from teacher to teacher and from day to day. Yet, the user of the classroom can be a perceptive judge of its performance.

1) Is it difficult for your students to hear and understand when you speak in a normal voice? ____ yes ____ no

2) Is there an abnormal amount of noise interference from student traffic areas, student playgrounds, and inside corridors? ____ yes ____ no

3) Does the sound from adjacent classrooms readily penetrate the walls into your room? ____ yes ____ no

4) Is your room located so that there is an abnormal amount of noise interference from autos, trains, or aircraft? ____ yes ____ no

5) Has acoustic tile or similar material been installed on the ceiling or the walls above door height? ____ yes ____ no

6) Within the room itself, are there noise interferences from:

heating and ventilating equipment?	____	____
plumbing lines and fixtures?	____	____
fluorescent fixtures?	____	____
other? (identify) _____	____	____
	yes	no

7) Would you rate your classroom as being <u>live</u> or <u>dead</u> acoustically? ____ live ____ dead

(A live room has many hard surface areas that cause sound to bounce and reverberate excessively. A dead room absorbs sound excessively and does not carry sufficient sound to the listener.)

8) Is the room acoustically satisfactory for:

recitation _____ lectures _____ conferences _____ quiet study _____

9) How would you rate the acoustical environment of this room?

excellent _____ good _____ satisfactory _____ poor _____ not acceptable _____

10) What recommendations do you have for improving the acoustics of your classroom?

Comment: _____

_____

B. LIGHTING AND ELECTRICAL SYSTEMS

Research evidence suggests that a properly designed luminous environment can enable students and teachers to see with greater comfort, speed, and accuracy than a poor luminous environment. To avoid the need for a technically qualified person to accurately measure the quantity of light, brightness, reflectances, and other criteria, the questions ask only whether the classroom occupants find the lighting comfortable.

1) What is the existing type of electric lighting system in this room?

   incandescent globes ____ concentric ring fixtures ____ indirect fluorescent fixtures____

   ceiling-mounted fluorescent fixtures ___ luminous ceiling ___ other _____

2) Is the amount of light adequate for seeing all general tasks with ease? ____ yes ____ no

   (Is light equally distributed throughout the room? Check for dark corners and distinct shadows across desk tops and on the floor.)

3) Are the walls and ceiling surfaces painted near white or a light pastel to serve as reflective surfaces? ____ yes ____ no

   (Colors with minimum reflectance of 70% are recommended.)

4) Is direct sunlight shielded from the room interior during school hours? ____ yes ____ no

5) Does the lighting system or daylight produce reflections on the chalk-boards that prevent students from seeing the material legibly? ____ yes ____ no

6) Do the light fixtures or windows seem excessively bright and cause eye discomfort or recurring complaints of headaches? ____ yes ____ no

   (Check for exposed bulbs or fluorescent tubes which create reflections from desk tops and mirror light directly into the student's eyes.)

7) Are there sufficient electrical outlets properly located to serve the audio-visual equipment and other electrical appliances? ____ yes ____ no

8) Is adequate night lighting provided at entrances, corridors, parking areas, and throughout the campus? ____ yes ____ no

9) How would you rate the visual environment of this room?

   excellent _____ good _____ satisfactory _____ poor _____ not acceptable _____

10) What recommendations do you have for improving the visual comfort of your classroom?

    Comment: _____

    _____

    _____

C. HEAT AND VENTILATION

The body has no adequate defense against extremes of heat and cold. A large part of our lives consists of an unending struggle to adjust to an unfriendly climate. We are comfortable only when the thermal exchange between our bodies and the surrounding environment is in equilibrium. Proper air temperature and adequate ventilation are critical factors in the educational environment.

1) Does the temperature vary noticeably at different locations within the room? _____ yes _____ no

2) Does the room tend to overheat? _____ yes _____ no
   Explain: _____
   _____

3) Is the room sometimes too cold? _____ yes _____ no
   Explain: _____
   _____

4) Is there evidence of excessive air currents or drafts? _____ yes _____ no

5) Is odor ever a problem? _____ yes _____ no
   Describe odor: _____
   What is the probable source? _____

6) Do you have adequate means to regulate and control the temperature? _____ yes _____ no

7) Is it often necessary to leave the doors or windows open to achieve adequate ventilation? _____ yes _____ no

8) What is the existing type of heating and ventilating system?
   forced air heating and ventilating _____ steam radiator _____ hot water radiator _____
   unit ventilator _____ unit heater _____ other _____

9) How would you rate the thermal environment of this room?
   excellent _____ good _____ satisfactory _____ poor _____ not acceptable _____

10) What recommendations do you have for improving the thermal comfort of your classroom?
    Comment: _____
    _____
    _____

D. EQUIPMENT AND FURNISHINGS

Teaching efficiency is largely dependent upon the tools provided. Classroom furniture and equipment are the basic instructional tools of education. It is these items of furniture and equipment that can be most readily replaced and up-dated. Unfortunately, most classrooms remain as originally furnished and become outmoded with time.

1) Are the cabinet work, wardrobe, and other storage adequate in quantity and sized to hold the materials actually used in your classroom? _____ yes _____ no

2) Are there adequate and properly located chalkboards, map rails, and pegboards in your room? _____ yes _____ no

3) Are the classroom walls designed to serve as tackboard for presentation of display material? _____ yes _____ no

4) Are the electrical outlets and plumbing services adequate and well-located to permit the use of modern equipment and teaching devices? _____ yes _____ no

5) Are there adequate counters with tops surfaced with low maintenance materials? _____ yes _____ no

6) Has the basic furniture, such as chairs and desks, been selected for mobility, resistance to breakage, and to permit correct posture? _____ yes _____ no

7) Do the windows have darkening drapes, louvers, or other means to darken the room for audio-visual presentations? _____ yes _____ no

8) Have the textures and finishes been selected for coordination of colors and materials? _____ yes _____ no

9) How would you rate the furniture and equipment provided for this room?

excellent _____ good _____ satisfactory _____ poor _____ not acceptable _____

10) What recommendations do you have for improving the equipment and furnishings of your classroom?

Comment: _____

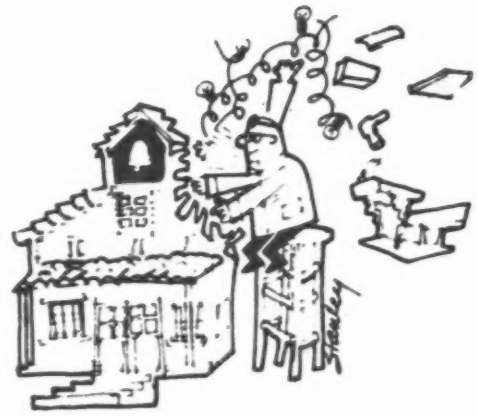
_____

_____

_____

Chapter VII
NEW WAYS TO SALVAGE OLD SCHOOLS

CHAPTER VII



NEW WAYS TO SALVAGE OLD SCHOOLS

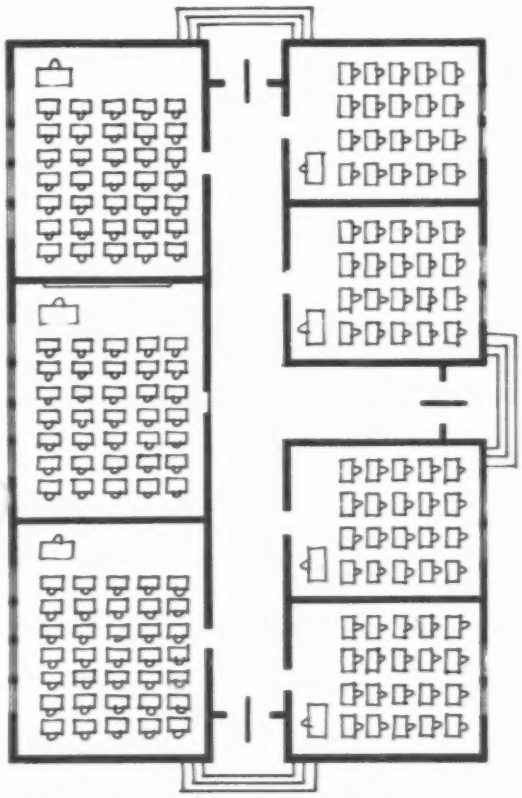
The odds for salvaging an old school are about one in four. (See Chapter V.) If your school is one of the twenty five percent that is educationally and financially worth the gamble of restoration, there are two paths that may be followed.

The familiar path is that of physical facility upgrading. Under this approach, modernization means spending minimum funds for surface improvements. These improvements are generally limited to such items as paint, acoustical tile, floor tile, and other similar repairs. Sometimes the improvements include modification of the lighting and heating systems, although this is not typical. Even when the classroom is refurbished with new chalkboards and tackboards, cabinetwork and furniture, the classroom remains only a classroom — space geometry is not altered to allow for activities or grouping of students other than can be served in a classroom. The decision to superficially improve the classroom rather than make major alterations to the building is generally the result of limited financial resources and does not represent the desire of school officials to work in half measures.

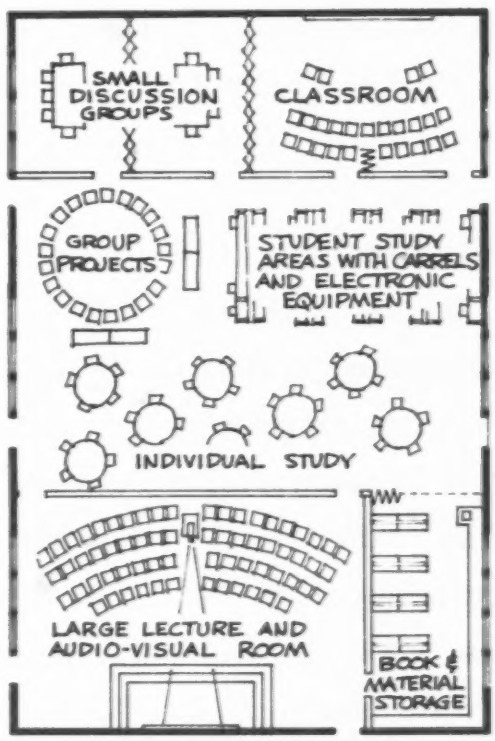
The other path, educational facility upgrading, is something else altogether. This approach examines what kind of facilities are required for education, now and in the future, with particular recognition of the promising innovations in teaching and school organization that have become widespread in recent years. A planning committee must be formed, composed of educational leaders from the district. They are charged with the responsibility of determining present educational needs and those that can be anticipated. (See Chapter VI.) These become the educational specifications that will guide the architect in preparing plan studies.

Space flexibility is the key to modernizing an older building just as it is in the construction of new schools. If the classroom is maintained with fixed walls and equipment to serve only the needs of a teacher and her thirty students working as an isolated unit, then this fixed space geometry will restrict the future use of the building to yesterday's education. New schools being planned and put into operation are basically large loft spaces in which the interiors can be readily modified to accommodate many varied teaching-learning activities. Of course, any existing building to be renovated represents a different problem from a

building planned from scratch. The existing structural elements will certainly exact a discipline over what is possible in modifying a 40 year old building into an open flexible structure, relatively independent of fixed interior elements.



SCHEMATIC PLAN SHOWING THE SCHOOL COMPARTMENTED INTO CLASSROOMS



LARGE & SMALL GROUP INSTRUCTIONAL AREAS

The educational environment is becoming more and more dependent upon the mechanical services which provide lighting, ventilation, and temperature and acoustical control with provisions for related furniture and equipment. The only requirement placed upon the building's structural system is that it should not be in the way of these services. Fortunately, most older school buildings have high ceilings (often over fourteen feet from floor to ceiling) which will permit ready installation of new environmental systems. If the ceiling is dropped to about the ten foot height, the space above can provide for the air conditioning ducts or serve as an air plenum. This space will also allow for the installation of a variety of lighting fixtures and, if required, water lines for a sprinkling system. The architect has many options in the design of the ceiling system. The typical assembly of acoustical panels suspended on T-bars with surface-mounted lighting fixtures is probably the most common. There are other systems which come as an integrated package from a single manufacturer which may be more refined, but decisions as to the actual materials, appliances, and assembly are within the architect's preserve.

The existing building must be prepared in order to accept these service systems. Non-bearing partitions and existing mechanical systems should be removed and the building interior left as a nearly gutted shell. Even interior bearing walls, if they can be replaced by wide-spaced post and beam supports, should be removed. Most of the mechanical services will have deteriorated over a forty or fifty year period; therefore, the walls that remain, including exterior walls and plumbing walls, should have the surface materials removed from the interior side so that existing plumbing, water and steam lines, and electrical conduit are exposed and can be replaced.

Consideration should be given to letting two separate contracts. The first contract would get the building gutted and left clean so that the architect can obtain confirmation of his reconstruction drawings and the subcontractors can make close cost estimates on the work to be done. (It is the unknowns that make remodeling cost proportionately more than new work.) Once the building is reduced to a clean cavity, it is ready for reconstruction and the various construction trades working from architect's plans and specifications can coordinate their work in a manner similar to that required for new construction. The second contract would be for materials and labor necessary to complete this reconstruction.

If the district staff is careful in determining their educational needs and if a skillful architect, supported with adequate funds, makes maximum use of the building's potential for modernization with emphasis on flexibility and comfort, the final product can be a modern school that will serve the community another half century without compromise.